

## Supplementary material:

### Mathematical explanation:

We made some assumptions to simplify the calculations:

- 1) Rate of recombination is constant
- 2) Only one recombination happens between two genes

Let's consider two heterozygous parents: AaBb and AaBb

Assume that one recombination event occur between genes A and B during meiosis then the alleles are A, a and B, b and the gametes will be Ab, AB, aB and ab

#### 1) If recombination occurs at an equal rate in both sexes: (Ideal case)

Gametes from female: Ab, AB, bA and ab

Gametes from male: Ab, AB, bA and ab

Among 16 possible progenies, 2 will be of parental type (underlined ones) and rest will be recombinants.

	AB	Ab	aB	Ab
AB	<u>AABB</u>	AABb	AaBB	AaBb
Ab	AABb	AAbb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	aaBb
ab	AaBb	Aabb	aaBb	<u>Aabb</u>

So the ratio of recombinant progeny will be  $14/16 = 7/8$

#### 2) In case of achiasmy in one sex (male):

Gametes from female: Ab, AB, bA and ab

Gametes from male: AB and ab

	AB	Ab	aB	Ab
AB	<u>AABB</u>	AABb	AaBB	AaBb
ab	AaBb	Aabb	aaBb	<u>Aabb</u>

So the ratio of recombinant progeny is:  $= 6/8$

The difference in frequency of recombinant progeny between ideal (recombination in both sexes) and achiasmy is:  $(7/8) - (6/8) = 1/8$

If we consider recombination between 3 genes: A, B and C and the parents are heterozygous for these genes AaBbCc

Then, The difference in frequency of recombinant progenies between ideal (recombination in both sexes) and achiasmy is:  $(31/32) - (14/16) = 3/32$

If we extrapolate this to ' $m$ ' genes, the difference in frequency of recombinant progenies between ideal (recombination in both sexes) and achiasmy  $= [2^{(m-1)} - 1] / (2^{(2m-1)})$

As the number ' $m$ ' increases, the difference in genetic variability between ideal and achiasmy conditions becomes negligible. This suggests that, shutting down recombination in one sex does not affect the genetic diversity in a population. Hence, the male flies might be directing their energy for producing more sperms rather than wasting it for an energy consuming process like recombination, to increase the chance of viable fertilizations.